

FIG. 1 PRIOR ART

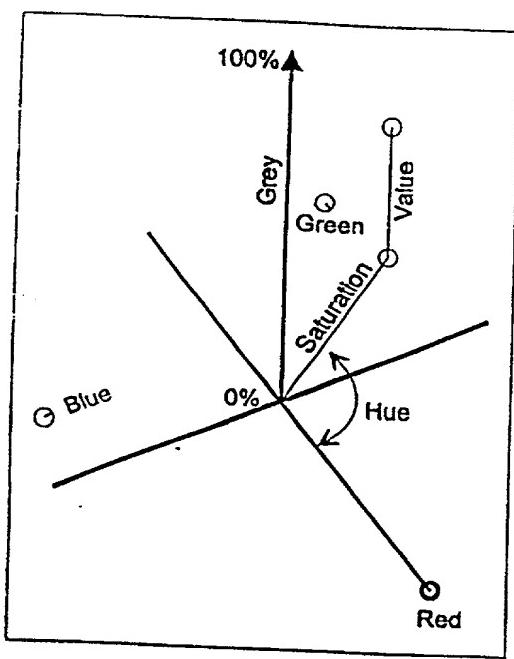


FIG. 2 PRIOR ART

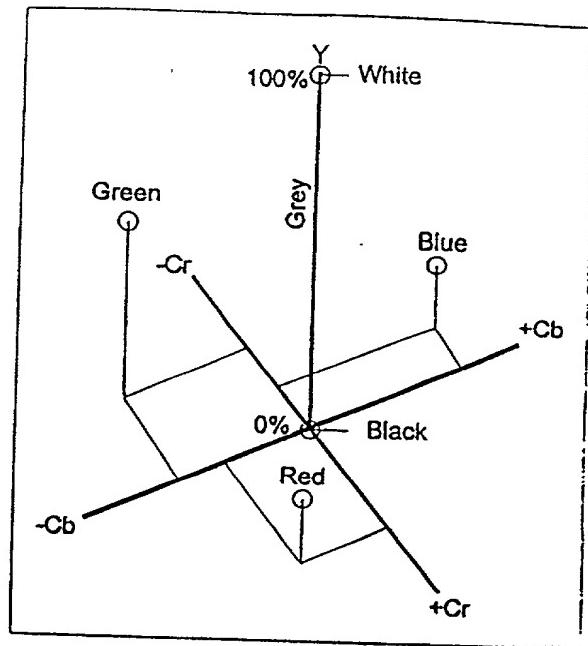


FIG. 3 PRIOR ART

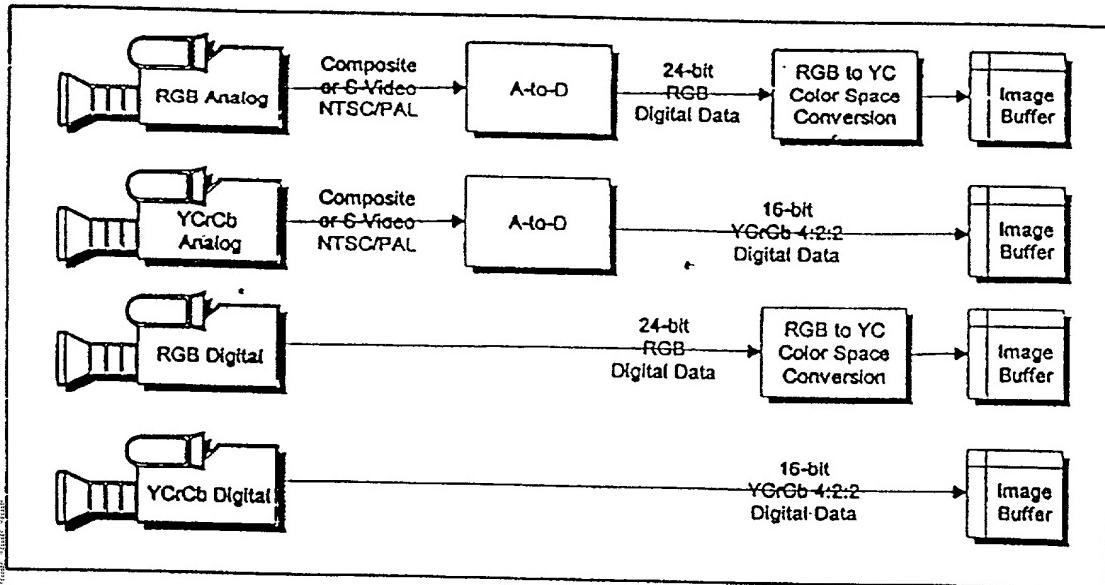


FIG. 4

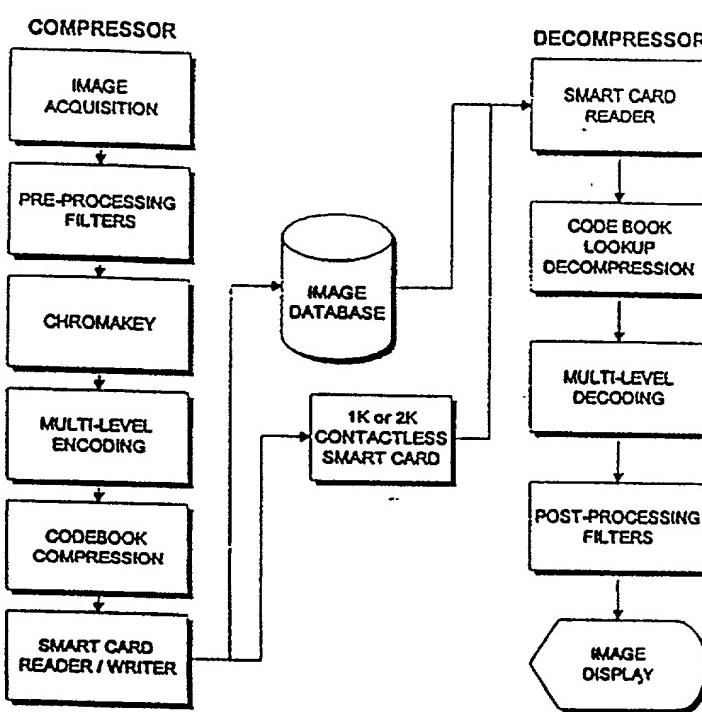


FIG. 5

If all pixels are within a specified threshold, the output is the average of the four pixels, two on each side of the target.

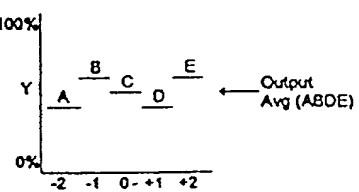


FIG. 6

If the two pixels on either side are within a specified threshold and both sides themselves are within the threshold, the target pixel is considered to be impulse noise. The output is the average of the two pixels on each side of the target.

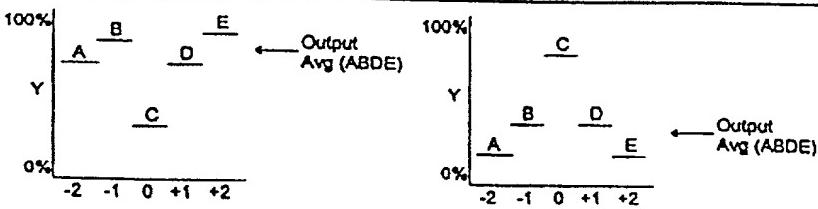


FIG. 7

If the two pixels on either side of the target pixel and the target pixel itself are within a specified threshold, the target pixel is

considered to be an edge pixel. The output is the average of the two pixels on the matching side.

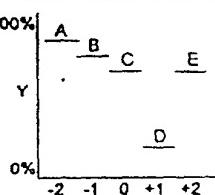
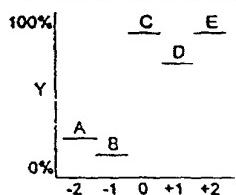


FIG. 8

If the five pixels are all increasing or decreasing (or are within a small threshold to account for ringing or pre-emphasis

typically found in analog video signals), the target is considered to be in the midst of a blurred edge. The output is the average of the two pixels on whichever side is closest to the target pixel.

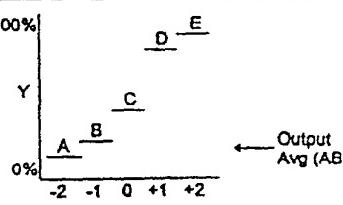
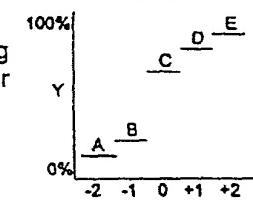


FIG. 9

If the five pixels in the window do not fit into any of the prior cases, the target is considered to be in the midst of a busy area. The target pixel is output unchanged.

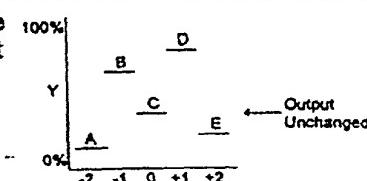


FIG. 10

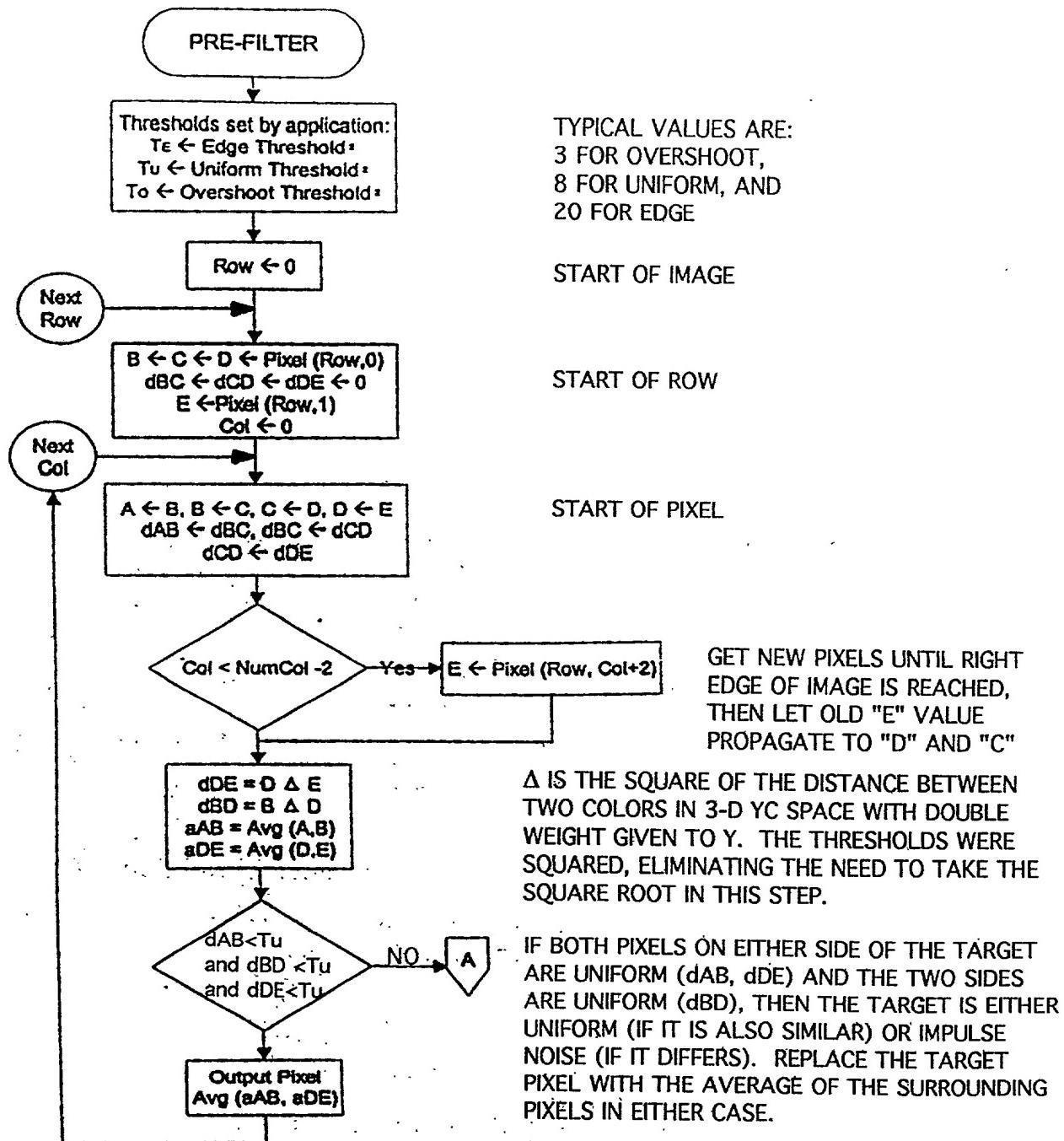


FIG. 11A

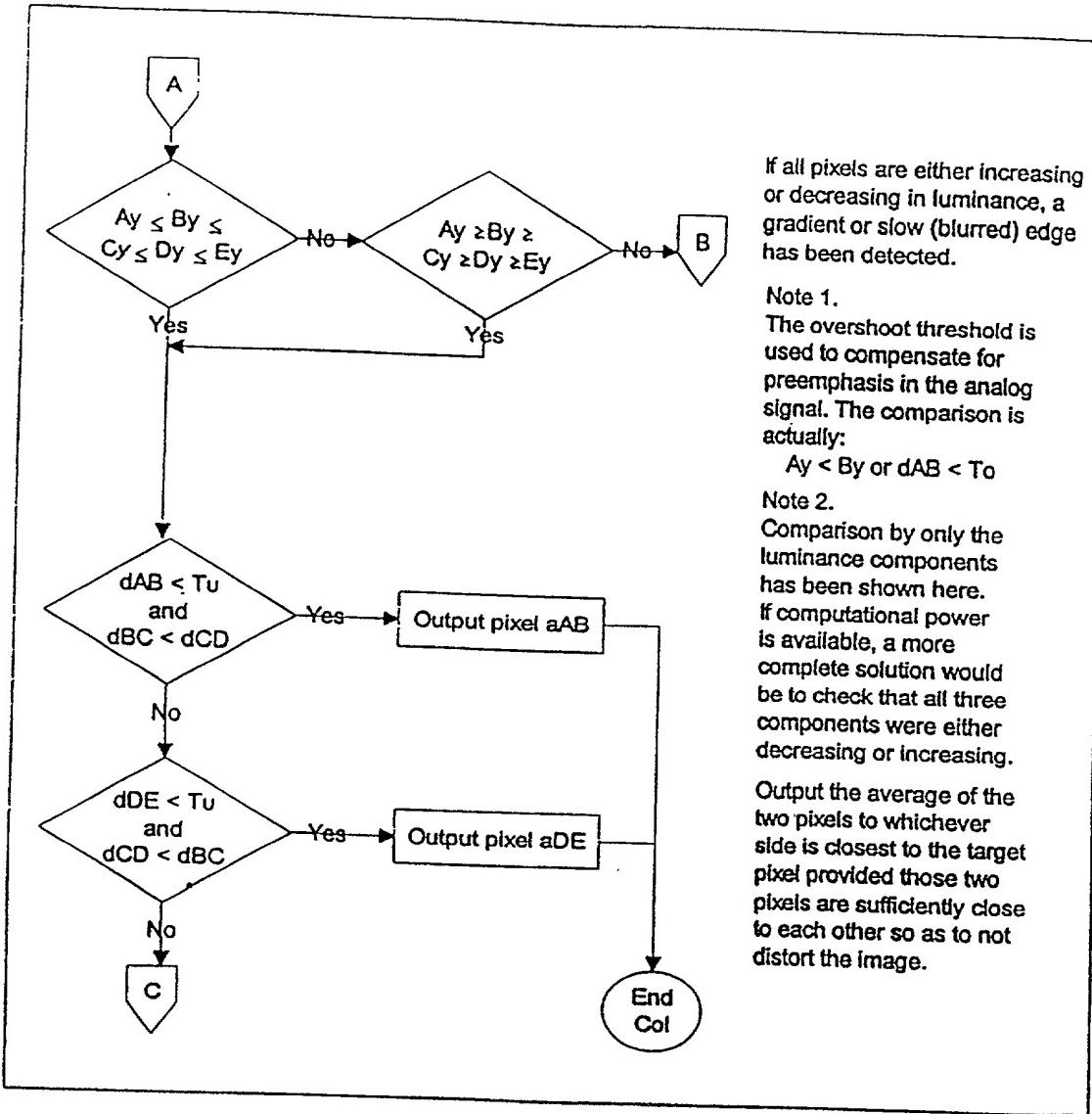


FIG. 11B

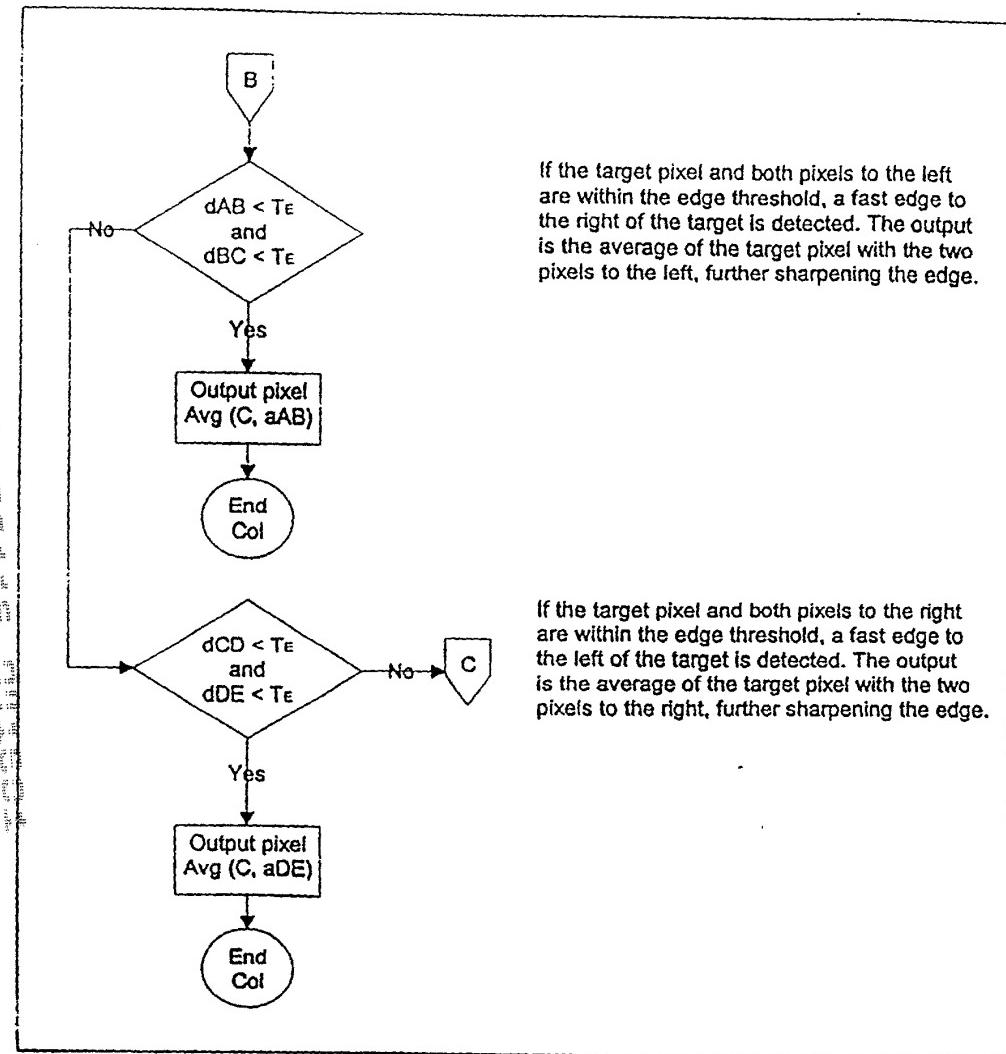
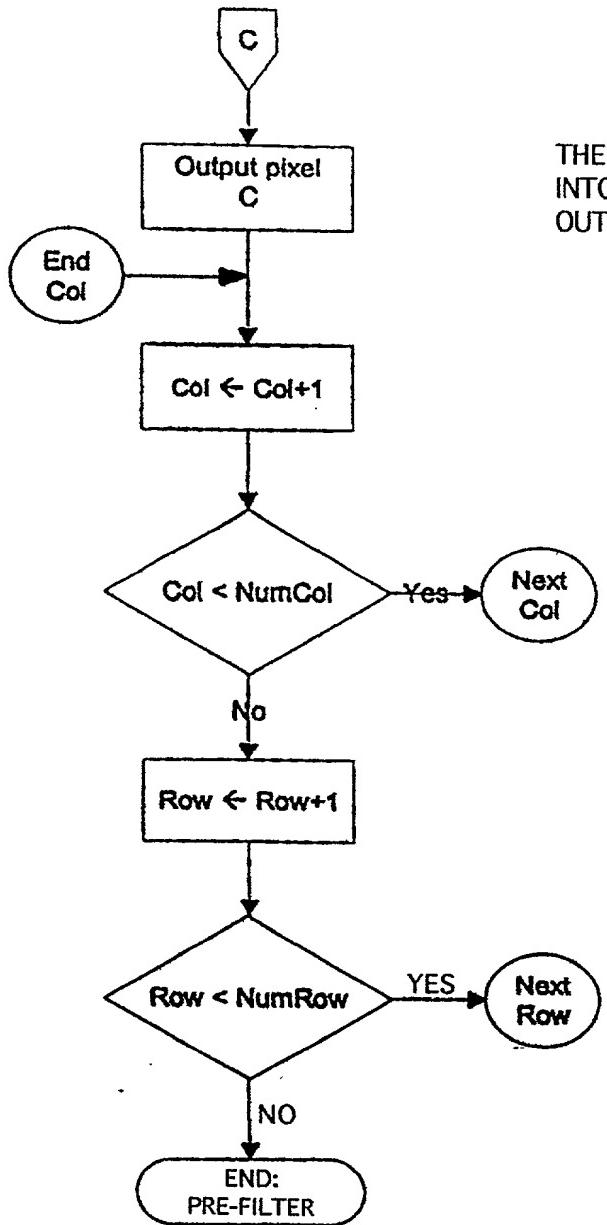


FIG. 11C



THE TARGET PIXEL HAS NOT FALLEN
INTO ANY OF THE CASES, SO IT IS
OUTPUT UNCHANGED.

FIG. 11D

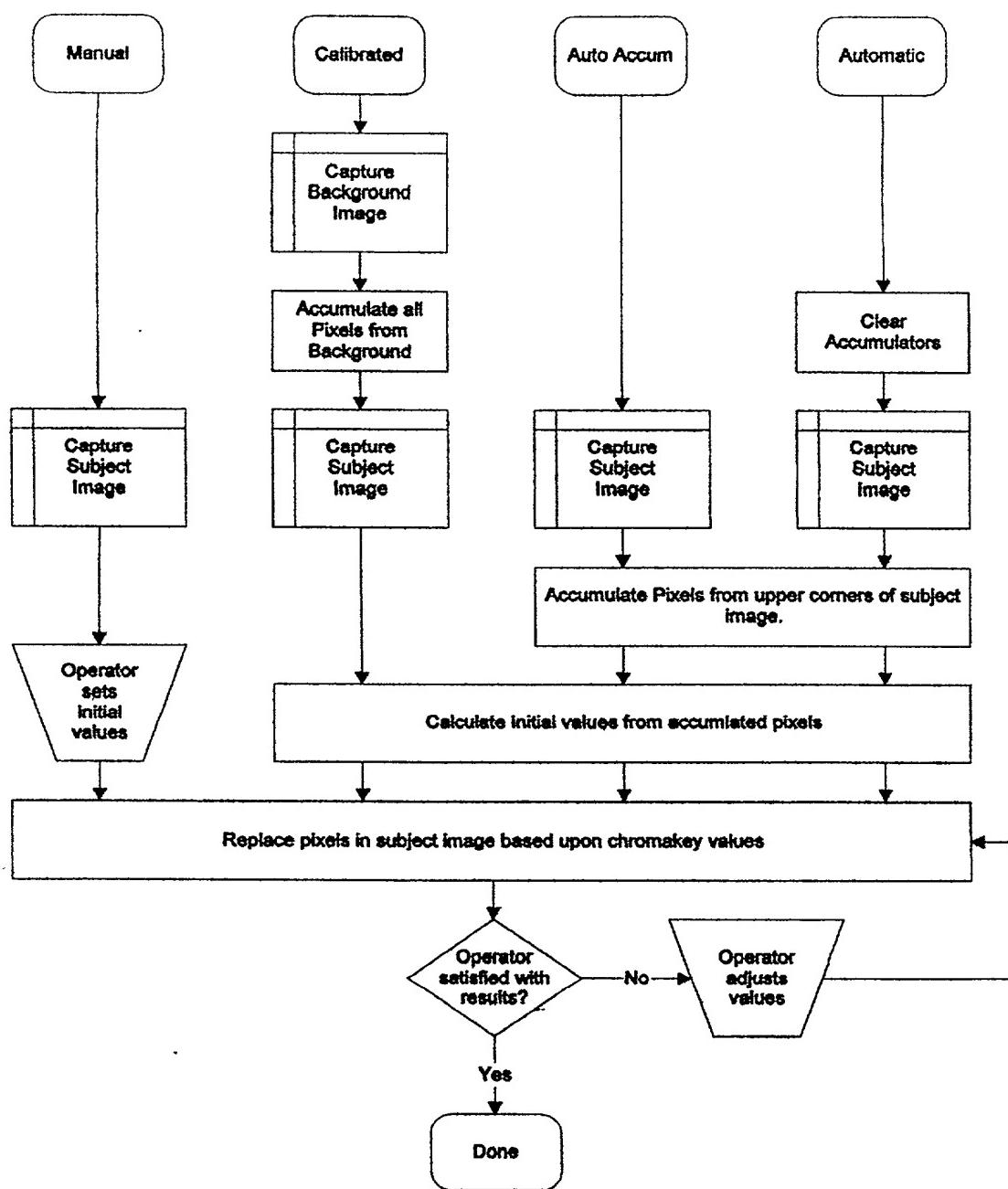


FIG. 11E

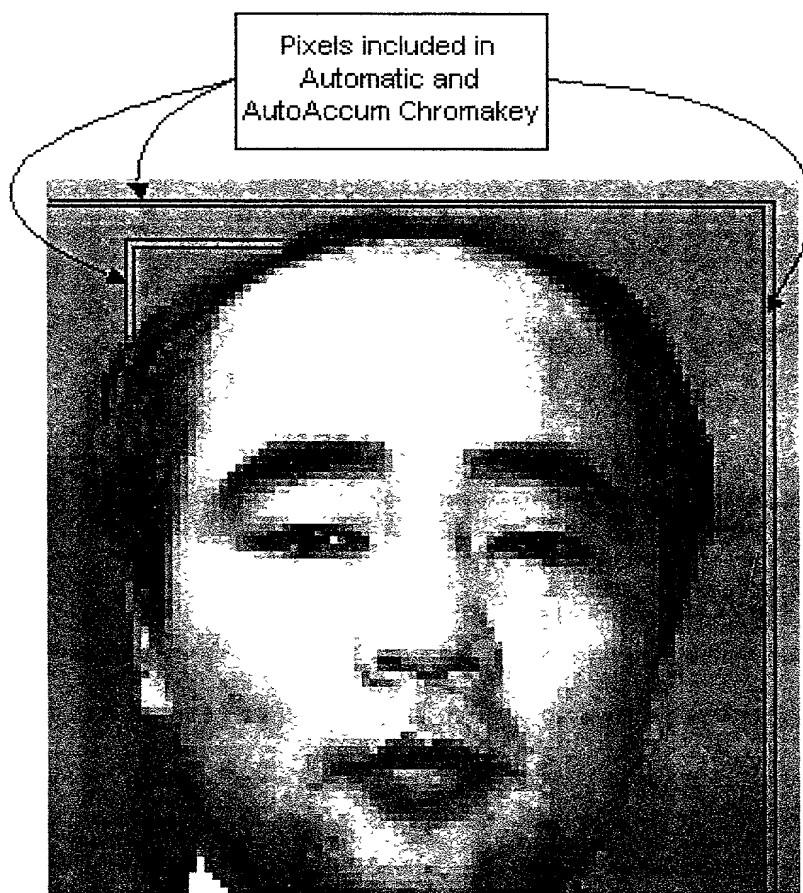
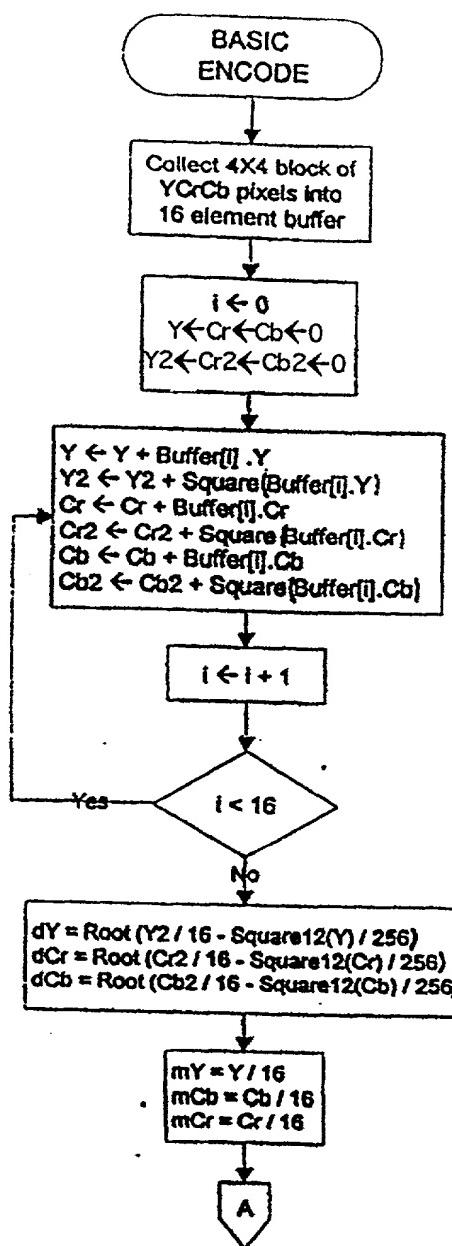


FIG. 11F



Buffer index will range from 0 to 15.
Color components will be referred to as: ".Y", ".Cr", and ".Cb"

Step 1 - Collect first and second moments

Accumulate separate component values as squares for each pixel. Squares are calculated by table lookup rather than by multiplication.

Step 2 - Calculate mean and standard deviation

The square12 function calculates the square of a 12-bit number using the same 8-bit table of squares above and little extra arithmetic. The root function finds roots by binary search of the 8-bit table of squares.

dY, dCr, and dCb are the standard deviations for each component and mY, mCr, and mCb are the arithmetic means.

FIG. 12A

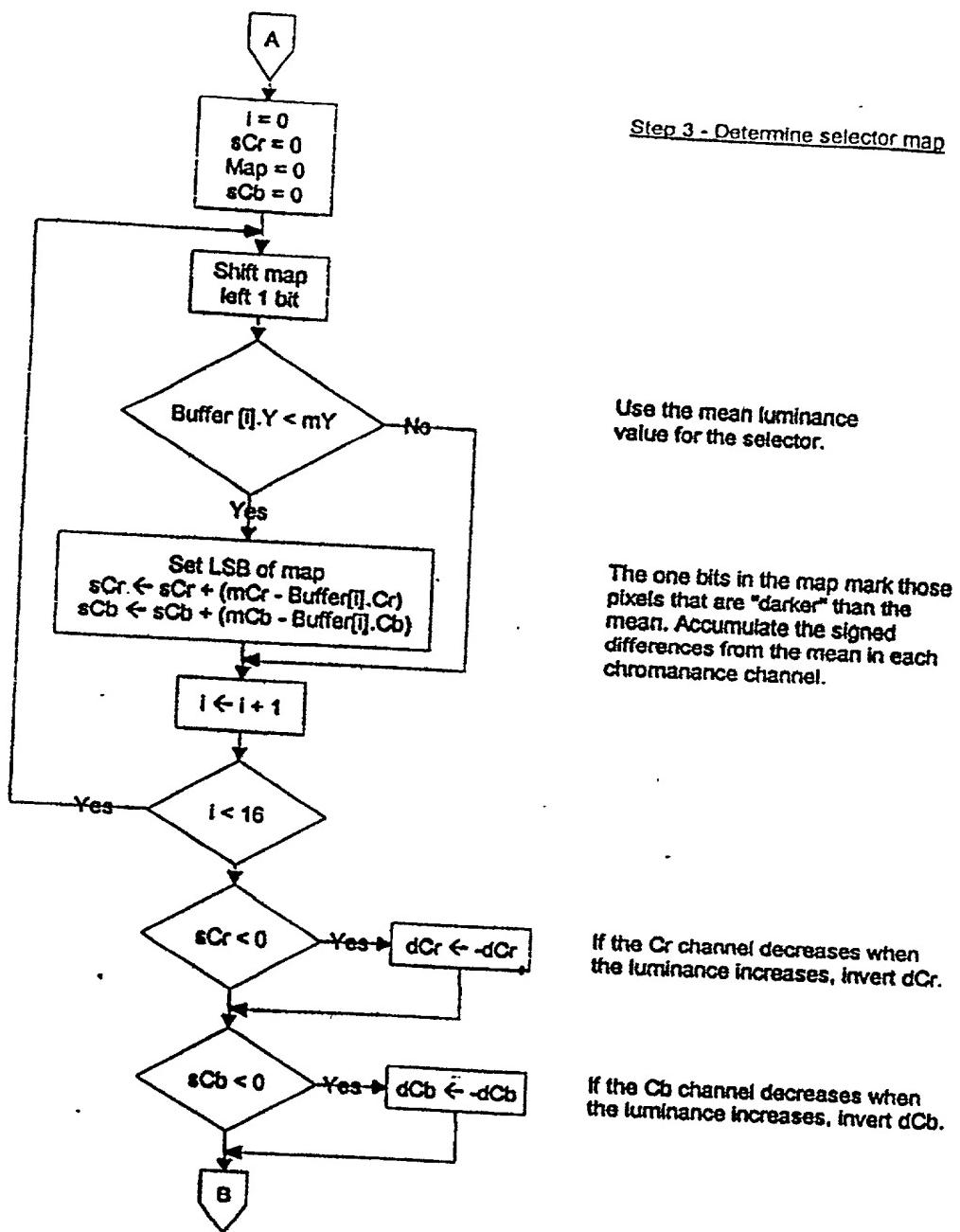


FIG. 12B

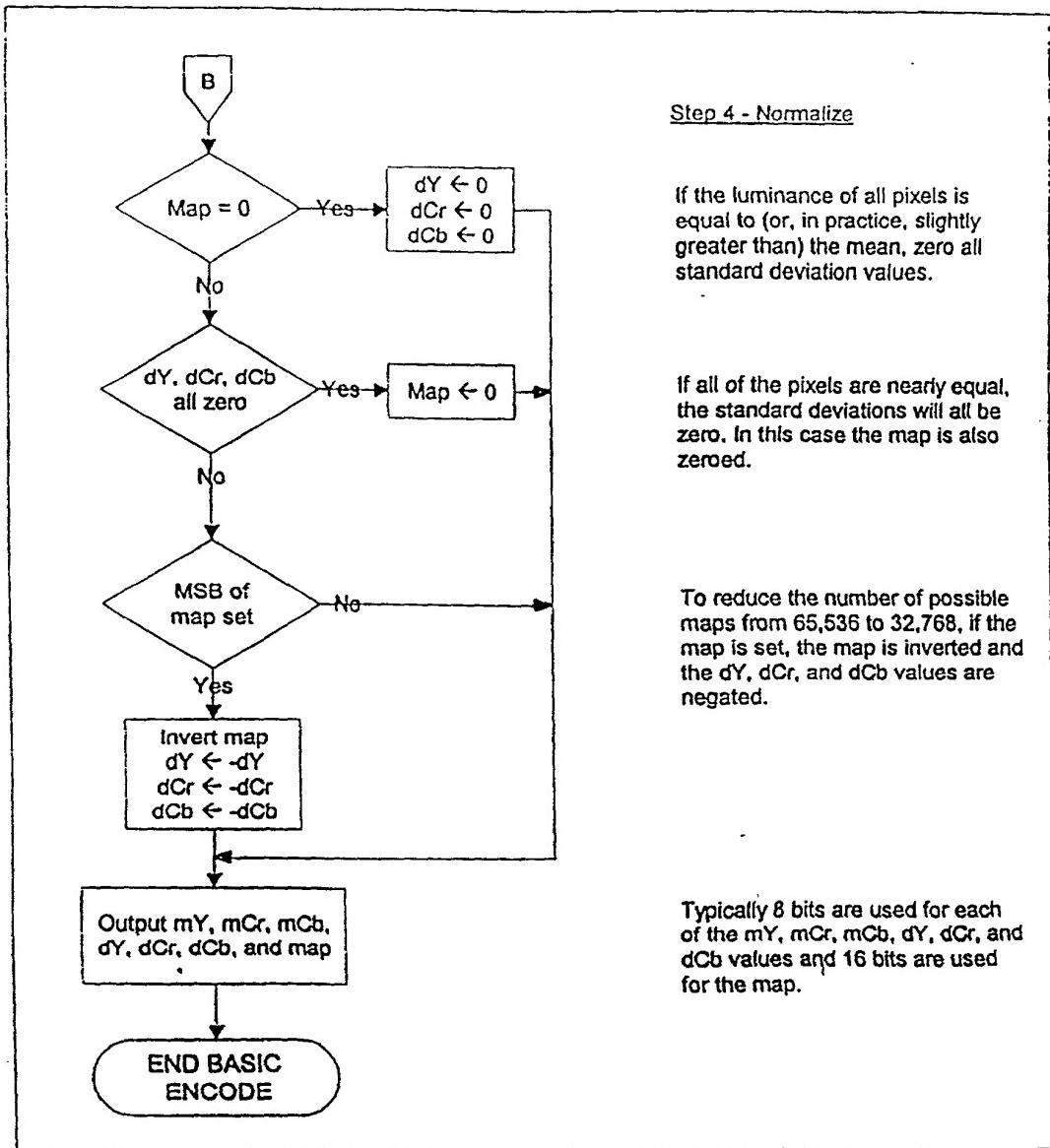


FIG. 12C

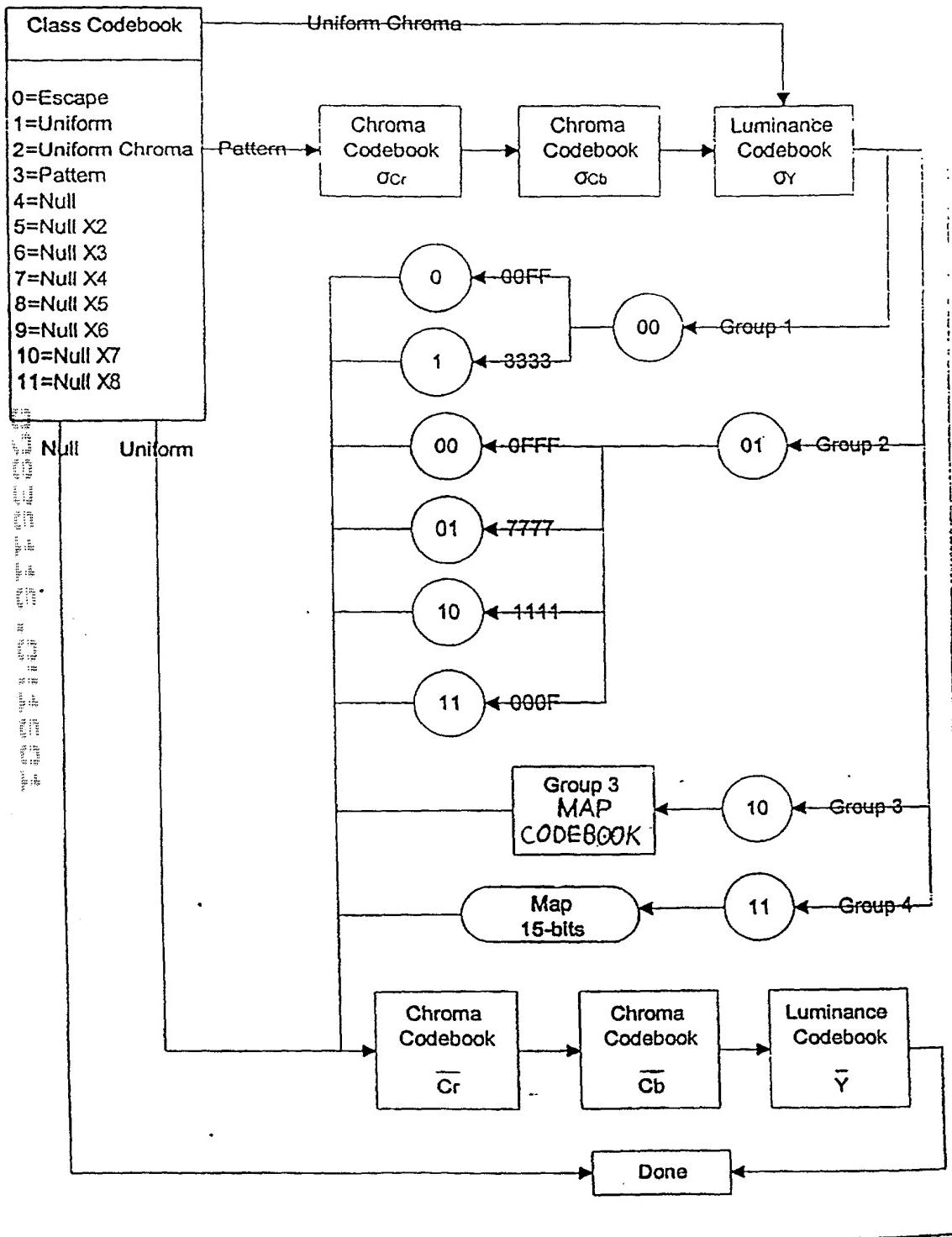


FIG. 13

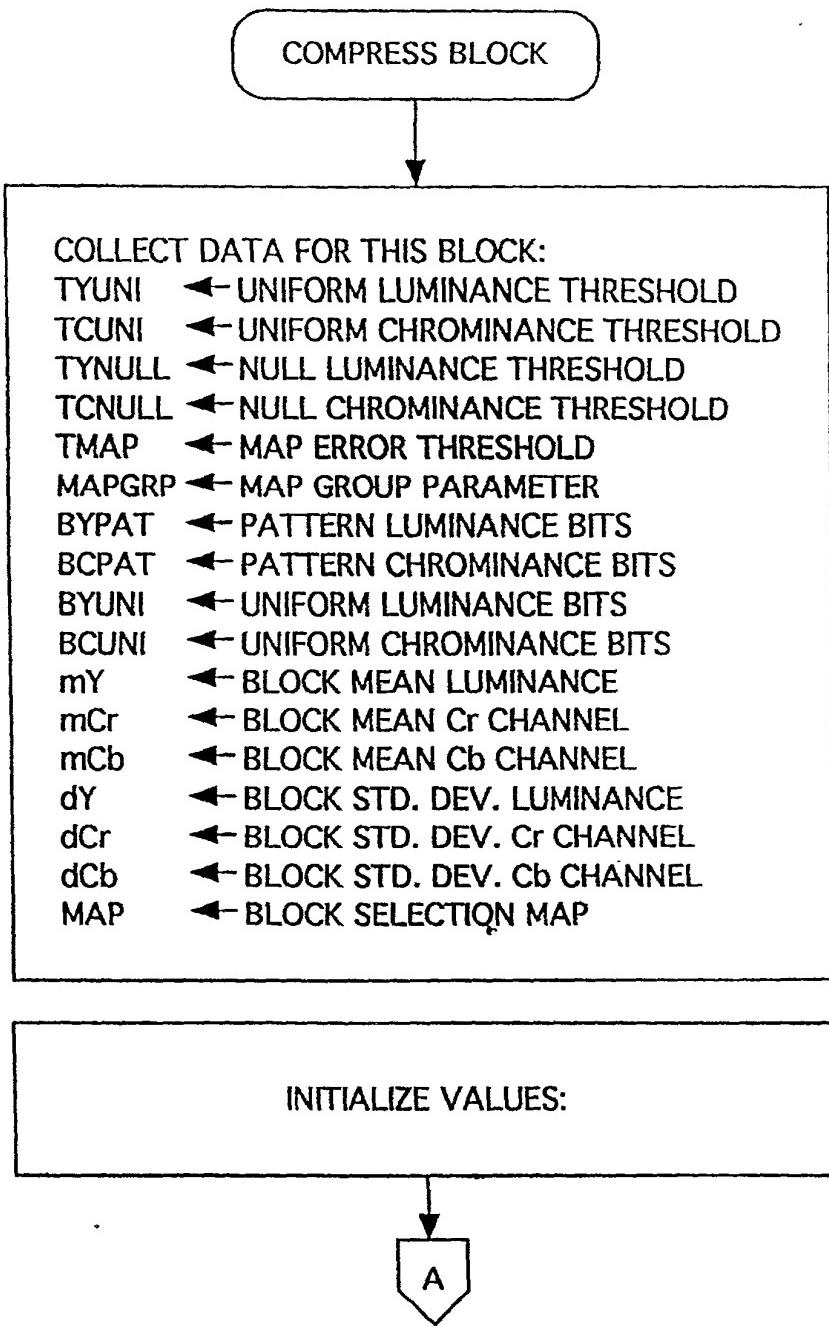
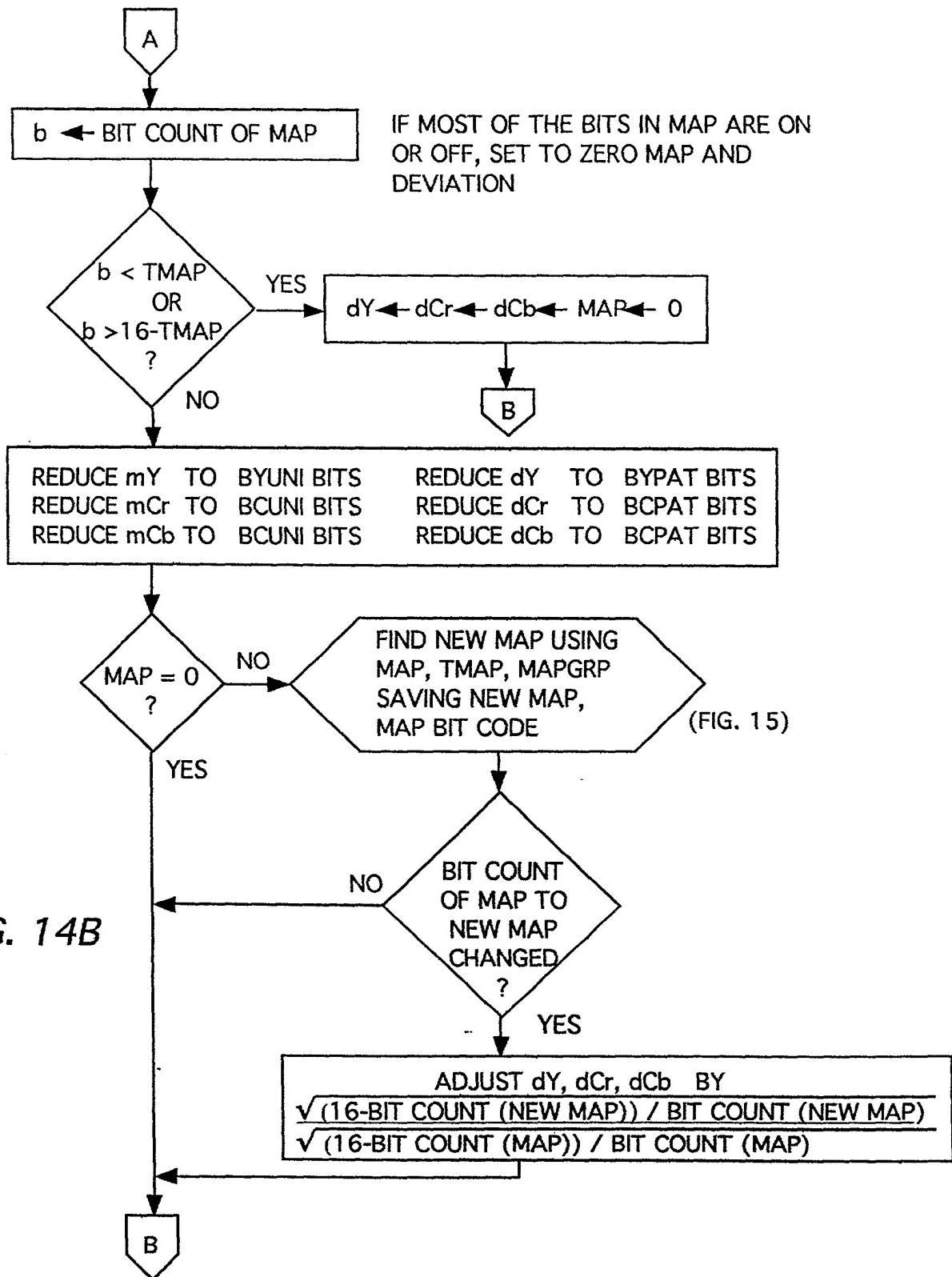


FIG. 14A



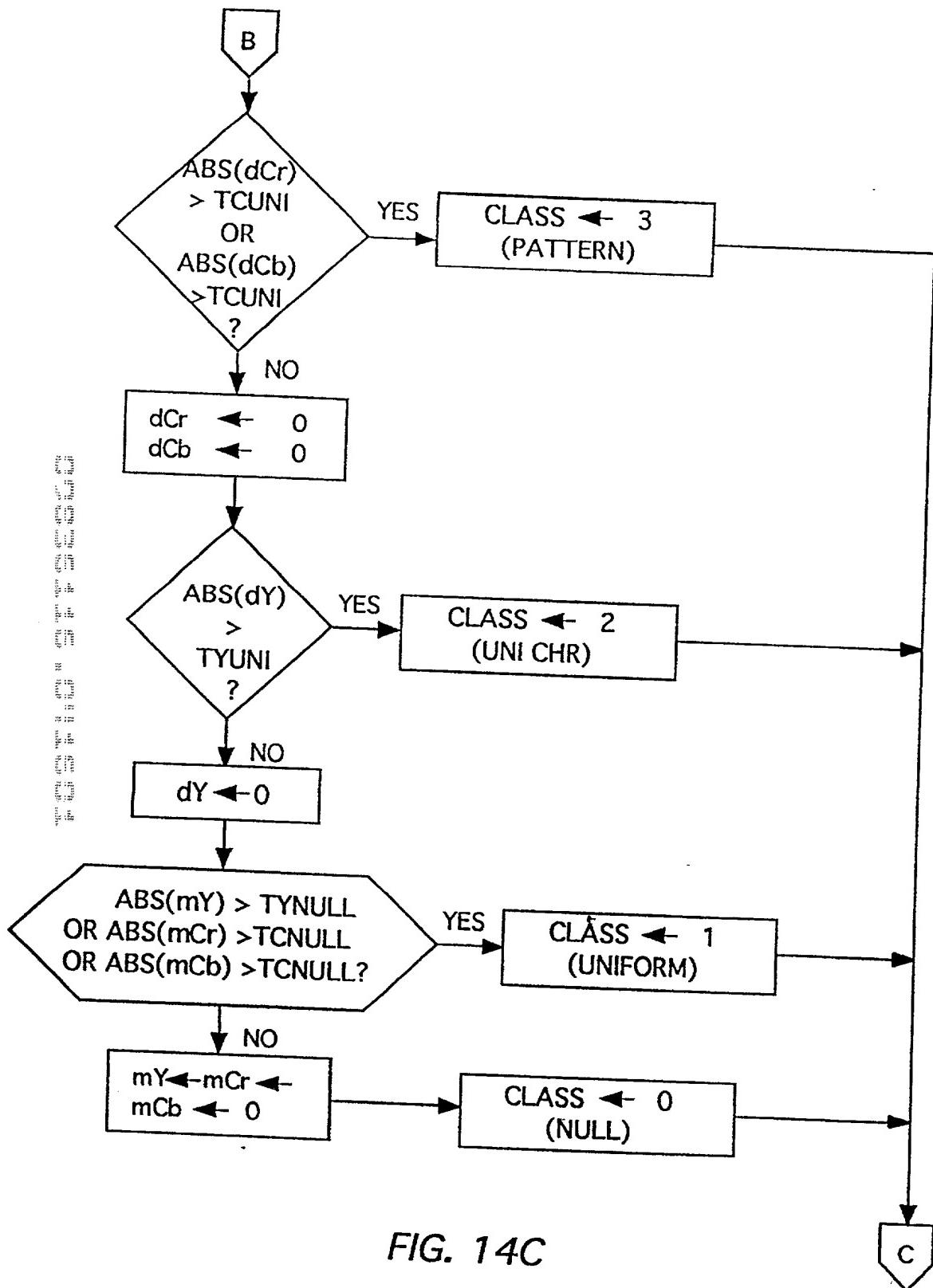


FIG. 14C

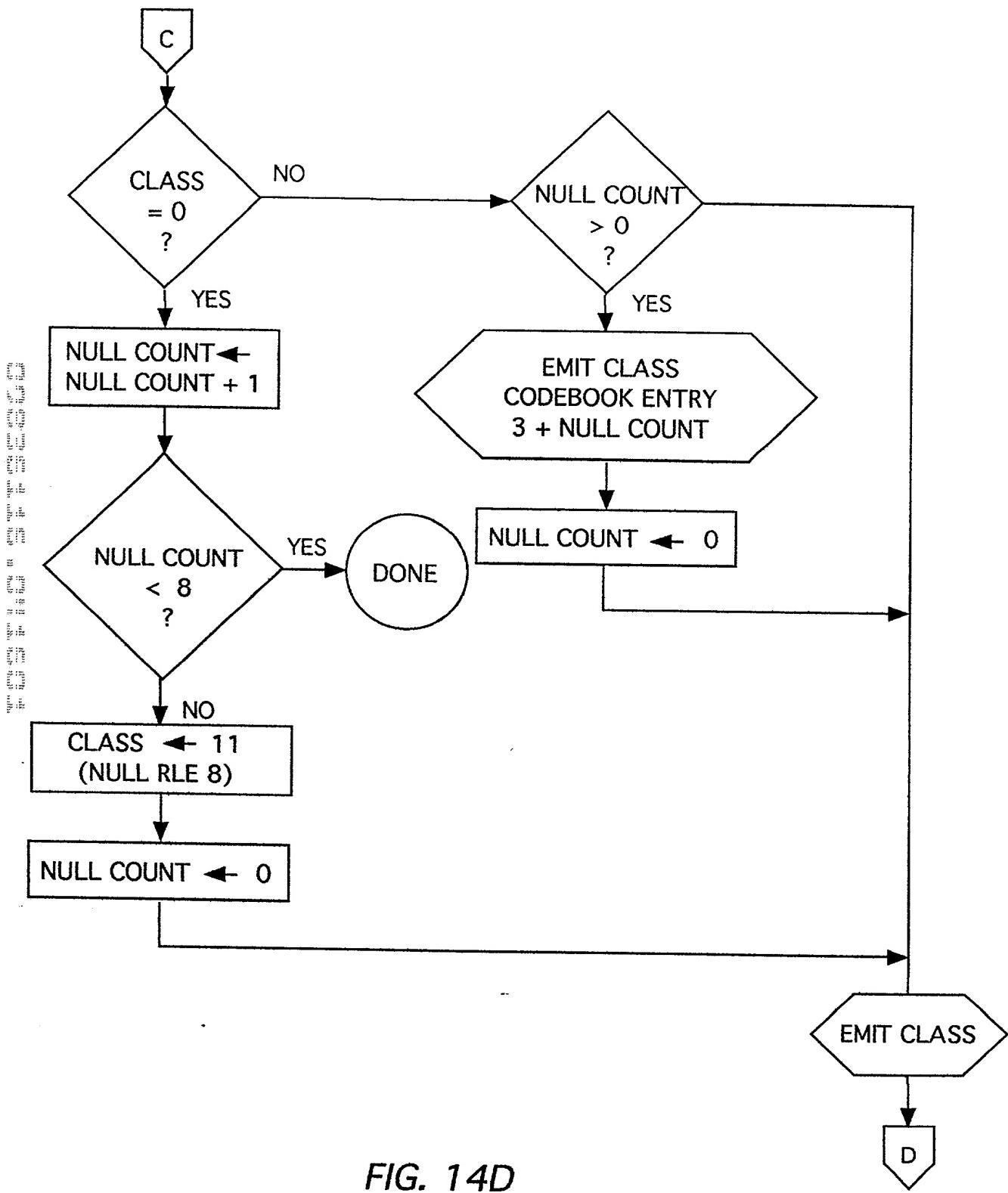


FIG. 14D

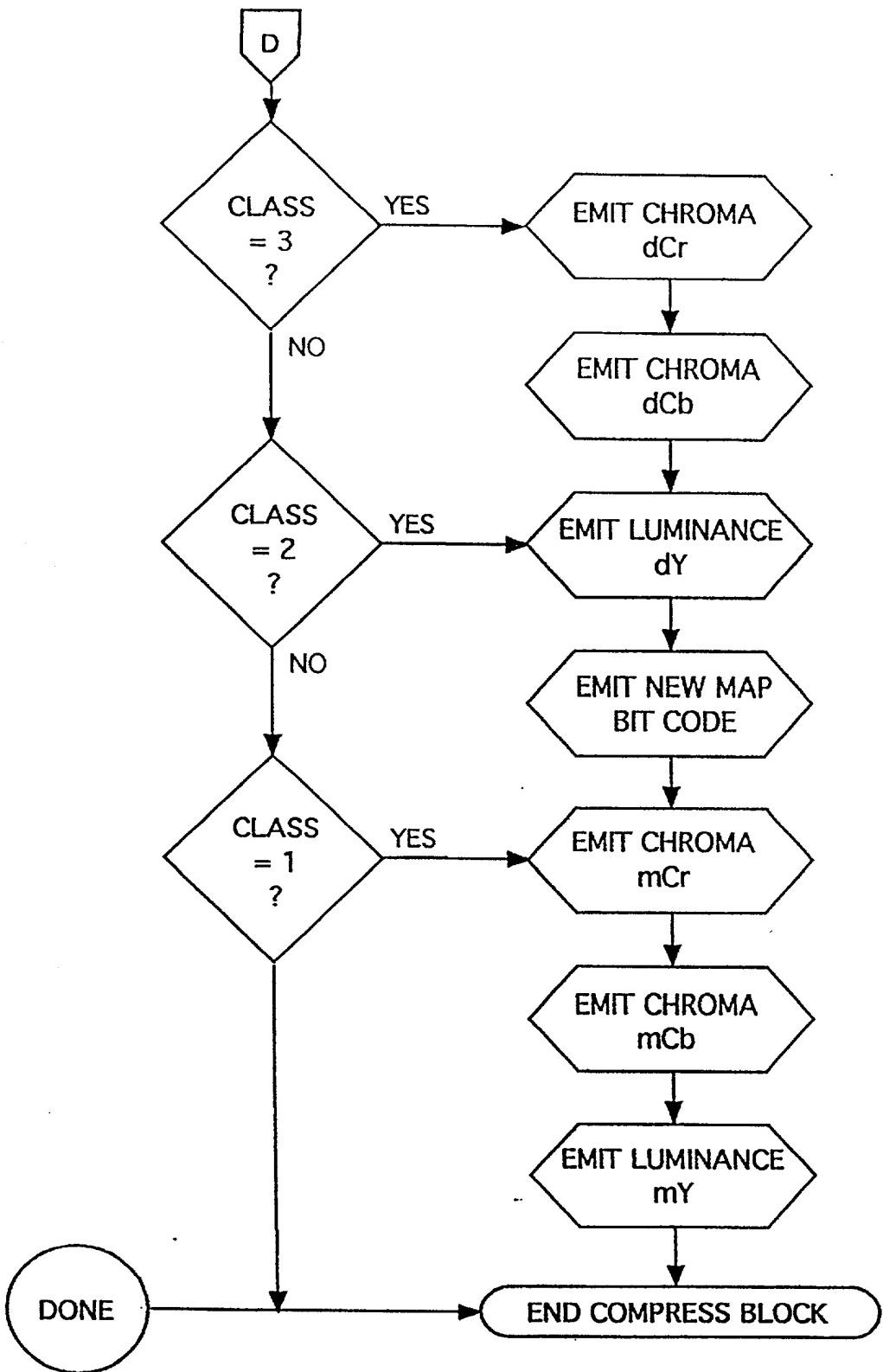


FIG. 14E

FIG. 15A

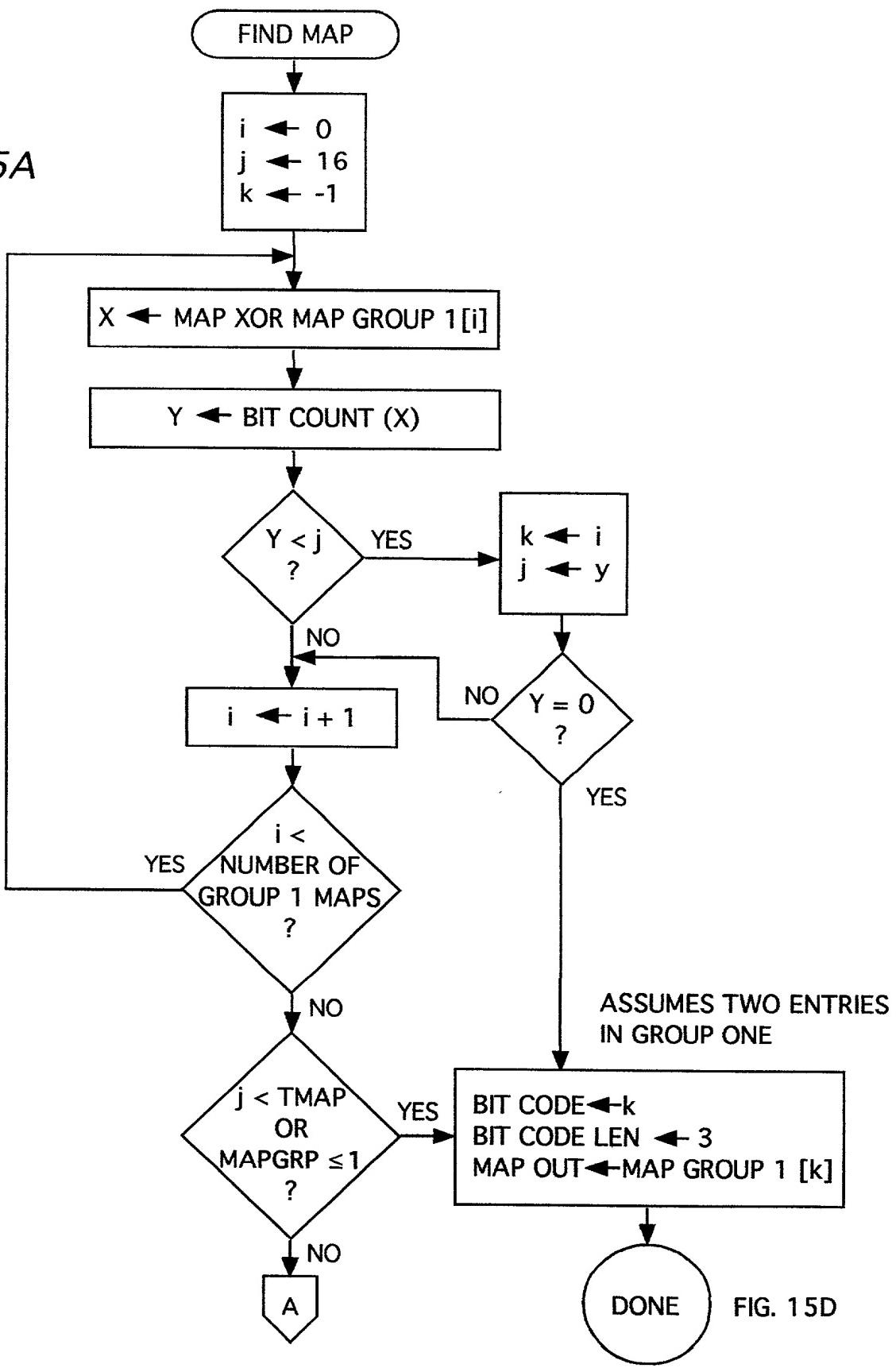


FIG. 15D

FIG. 15B

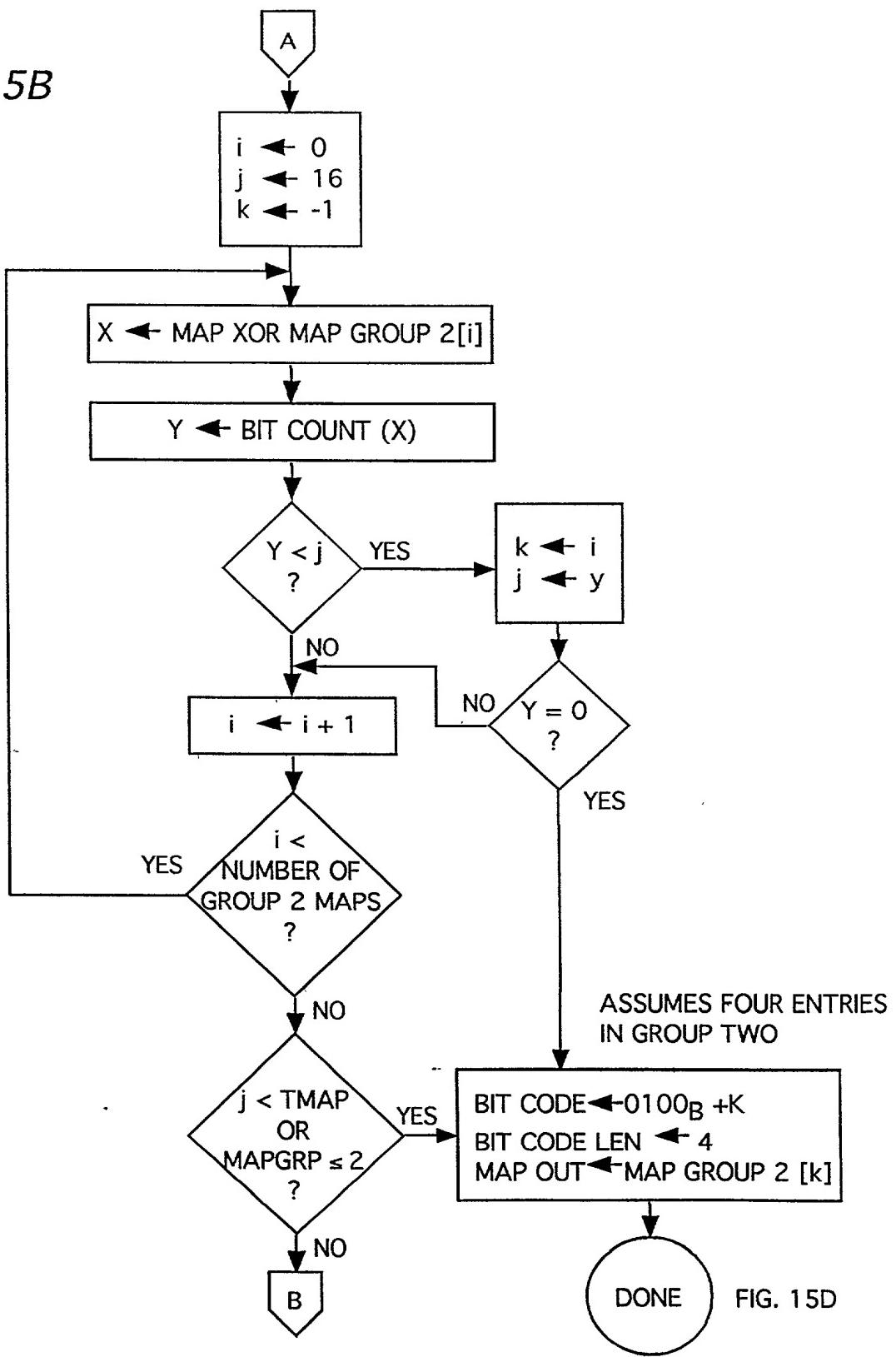


FIG. 15C

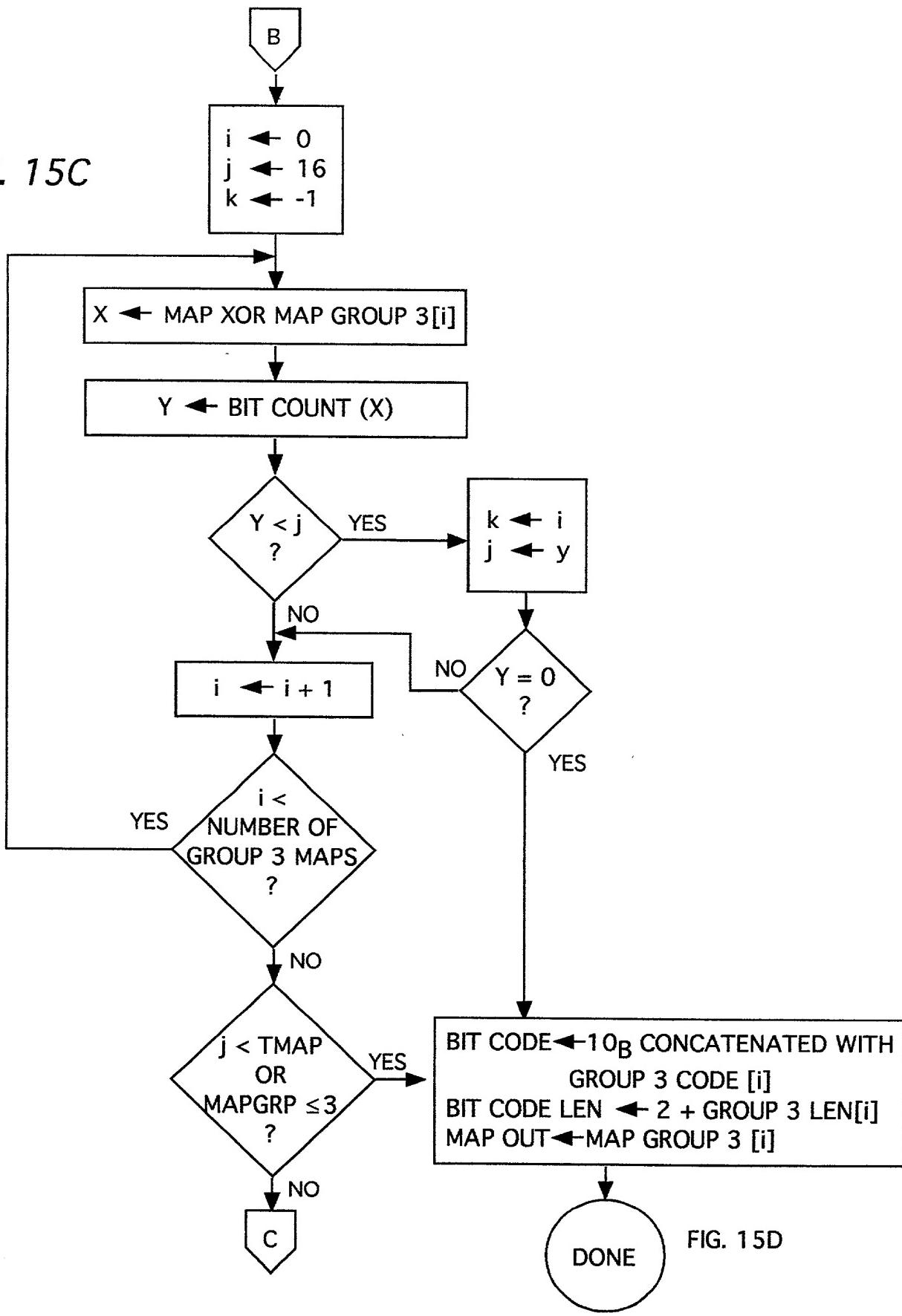


FIG. 15D

FIG. 16A

D	D	D	D	D	D
D	C	B	B	C	D
D	B	A	A	B	D
D	B	A	A	B	D
D	C	B	B	C	D
D	D	D	D	D	D

	CIRCLE	OVAL	BELL																																																																																																																																																																																																
NON-TRUNCATED	<table border="1"> <tr><td>60</td><td>52</td><td>44</td><td>32</td><td>33</td><td>45</td><td>53</td><td>61</td></tr> <tr><td>54</td><td>34</td><td>24</td><td>16</td><td>17</td><td>25</td><td>35</td><td>55</td></tr> <tr><td>46</td><td>26</td><td>12</td><td>4</td><td>5</td><td>13</td><td>27</td><td>47</td></tr> <tr><td>36</td><td>18</td><td>6</td><td>0</td><td>1</td><td>7</td><td>19</td><td>37</td></tr> <tr><td>38</td><td>20</td><td>8</td><td>2</td><td>3</td><td>9</td><td>21</td><td>39</td></tr> <tr><td>48</td><td>28</td><td>14</td><td>10</td><td>11</td><td>15</td><td>29</td><td>49</td></tr> <tr><td>56</td><td>40</td><td>30</td><td>22</td><td>23</td><td>31</td><td>41</td><td>57</td></tr> <tr><td>62</td><td>58</td><td>50</td><td>42</td><td>43</td><td>51</td><td>59</td><td>63</td></tr> </table>	60	52	44	32	33	45	53	61	54	34	24	16	17	25	35	55	46	26	12	4	5	13	27	47	36	18	6	0	1	7	19	37	38	20	8	2	3	9	21	39	48	28	14	10	11	15	29	49	56	40	30	22	23	31	41	57	62	58	50	42	43	51	59	63	<table border="1"> <tr><td>60</td><td>52</td><td>40</td><td>32</td><td>33</td><td>41</td><td>53</td><td>61</td></tr> <tr><td>56</td><td>36</td><td>24</td><td>16</td><td>17</td><td>25</td><td>37</td><td>57</td></tr> <tr><td>48</td><td>28</td><td>12</td><td>4</td><td>5</td><td>13</td><td>29</td><td>49</td></tr> <tr><td>42</td><td>20</td><td>8</td><td>0</td><td>1</td><td>9</td><td>21</td><td>43</td></tr> <tr><td>44</td><td>22</td><td>10</td><td>2</td><td>3</td><td>11</td><td>23</td><td>45</td></tr> <tr><td>50</td><td>30</td><td>14</td><td>6</td><td>7</td><td>15</td><td>31</td><td>51</td></tr> <tr><td>58</td><td>38</td><td>26</td><td>18</td><td>19</td><td>27</td><td>39</td><td>59</td></tr> <tr><td>62</td><td>54</td><td>46</td><td>34</td><td>35</td><td>47</td><td>55</td><td>63</td></tr> </table>	60	52	40	32	33	41	53	61	56	36	24	16	17	25	37	57	48	28	12	4	5	13	29	49	42	20	8	0	1	9	21	43	44	22	10	2	3	11	23	45	50	30	14	6	7	15	31	51	58	38	26	18	19	27	39	59	62	54	46	34	35	47	55	63	<table border="1"> <tr><td>62</td><td>58</td><td>54</td><td>44</td><td>45</td><td>55</td><td>59</td><td>63</td></tr> <tr><td>56</td><td>46</td><td>34</td><td>26</td><td>27</td><td>35</td><td>47</td><td>57</td></tr> <tr><td>50</td><td>30</td><td>16</td><td>10</td><td>11</td><td>17</td><td>31</td><td>51</td></tr> <tr><td>40</td><td>24</td><td>12</td><td>4</td><td>5</td><td>13</td><td>25</td><td>41</td></tr> <tr><td>38</td><td>18</td><td>6</td><td>0</td><td>1</td><td>7</td><td>19</td><td>39</td></tr> <tr><td>42</td><td>22</td><td>8</td><td>2</td><td>3</td><td>9</td><td>23</td><td>43</td></tr> <tr><td>52</td><td>32</td><td>20</td><td>14</td><td>15</td><td>21</td><td>33</td><td>53</td></tr> <tr><td>60</td><td>48</td><td>36</td><td>28</td><td>29</td><td>37</td><td>49</td><td>61</td></tr> </table>	62	58	54	44	45	55	59	63	56	46	34	26	27	35	47	57	50	30	16	10	11	17	31	51	40	24	12	4	5	13	25	41	38	18	6	0	1	7	19	39	42	22	8	2	3	9	23	43	52	32	20	14	15	21	33	53	60	48	36	28	29	37	49	61
60	52	44	32	33	45	53	61																																																																																																																																																																																												
54	34	24	16	17	25	35	55																																																																																																																																																																																												
46	26	12	4	5	13	27	47																																																																																																																																																																																												
36	18	6	0	1	7	19	37																																																																																																																																																																																												
38	20	8	2	3	9	21	39																																																																																																																																																																																												
48	28	14	10	11	15	29	49																																																																																																																																																																																												
56	40	30	22	23	31	41	57																																																																																																																																																																																												
62	58	50	42	43	51	59	63																																																																																																																																																																																												
60	52	40	32	33	41	53	61																																																																																																																																																																																												
56	36	24	16	17	25	37	57																																																																																																																																																																																												
48	28	12	4	5	13	29	49																																																																																																																																																																																												
42	20	8	0	1	9	21	43																																																																																																																																																																																												
44	22	10	2	3	11	23	45																																																																																																																																																																																												
50	30	14	6	7	15	31	51																																																																																																																																																																																												
58	38	26	18	19	27	39	59																																																																																																																																																																																												
62	54	46	34	35	47	55	63																																																																																																																																																																																												
62	58	54	44	45	55	59	63																																																																																																																																																																																												
56	46	34	26	27	35	47	57																																																																																																																																																																																												
50	30	16	10	11	17	31	51																																																																																																																																																																																												
40	24	12	4	5	13	25	41																																																																																																																																																																																												
38	18	6	0	1	7	19	39																																																																																																																																																																																												
42	22	8	2	3	9	23	43																																																																																																																																																																																												
52	32	20	14	15	21	33	53																																																																																																																																																																																												
60	48	36	28	29	37	49	61																																																																																																																																																																																												
TRUNCATED	<table border="1"> <tr><td>X</td><td>X</td><td>44</td><td>32</td><td>33</td><td>45</td><td>X</td><td>X</td></tr> <tr><td>X</td><td>34</td><td>24</td><td>16</td><td>17</td><td>25</td><td>35</td><td>X</td></tr> <tr><td>46</td><td>26</td><td>12</td><td>4</td><td>5</td><td>13</td><td>27</td><td>47</td></tr> <tr><td>36</td><td>18</td><td>6</td><td>0</td><td>1</td><td>7</td><td>19</td><td>37</td></tr> <tr><td>38</td><td>20</td><td>8</td><td>2</td><td>3</td><td>9</td><td>21</td><td>39</td></tr> <tr><td>48</td><td>28</td><td>14</td><td>10</td><td>11</td><td>15</td><td>29</td><td>49</td></tr> <tr><td>X</td><td>40</td><td>30</td><td>22</td><td>23</td><td>31</td><td>41</td><td>X</td></tr> <tr><td>X</td><td>X</td><td>50</td><td>42</td><td>43</td><td>51</td><td>X</td><td>X</td></tr> </table>	X	X	44	32	33	45	X	X	X	34	24	16	17	25	35	X	46	26	12	4	5	13	27	47	36	18	6	0	1	7	19	37	38	20	8	2	3	9	21	39	48	28	14	10	11	15	29	49	X	40	30	22	23	31	41	X	X	X	50	42	43	51	X	X	<table border="1"> <tr><td>X</td><td>X</td><td>40</td><td>32</td><td>33</td><td>41</td><td>X</td><td>X</td></tr> <tr><td>X</td><td>36</td><td>24</td><td>16</td><td>17</td><td>25</td><td>37</td><td>X</td></tr> <tr><td>48</td><td>28</td><td>12</td><td>4</td><td>5</td><td>3</td><td>29</td><td>49</td></tr> <tr><td>42</td><td>20</td><td>8</td><td>0</td><td>1</td><td>9</td><td>21</td><td>43</td></tr> <tr><td>44</td><td>22</td><td>10</td><td>2</td><td>3</td><td>1</td><td>23</td><td>45</td></tr> <tr><td>50</td><td>30</td><td>14</td><td>6</td><td>7</td><td>5</td><td>31</td><td>51</td></tr> <tr><td>X</td><td>38</td><td>26</td><td>18</td><td>19</td><td>27</td><td>39</td><td>X</td></tr> <tr><td>X</td><td>X</td><td>46</td><td>34</td><td>35</td><td>47</td><td>X</td><td>X</td></tr> </table>	X	X	40	32	33	41	X	X	X	36	24	16	17	25	37	X	48	28	12	4	5	3	29	49	42	20	8	0	1	9	21	43	44	22	10	2	3	1	23	45	50	30	14	6	7	5	31	51	X	38	26	18	19	27	39	X	X	X	46	34	35	47	X	X	<table border="1"> <tr><td>X</td><td>X</td><td>50</td><td>44</td><td>45</td><td>51</td><td>X</td><td>X</td></tr> <tr><td>X</td><td>46</td><td>34</td><td>26</td><td>27</td><td>35</td><td>47</td><td>X</td></tr> <tr><td>48</td><td>30</td><td>16</td><td>10</td><td>11</td><td>17</td><td>31</td><td>49</td></tr> <tr><td>40</td><td>24</td><td>12</td><td>4</td><td>5</td><td>13</td><td>25</td><td>41</td></tr> <tr><td>38</td><td>18</td><td>6</td><td>0</td><td>1</td><td>7</td><td>19</td><td>39</td></tr> <tr><td>42</td><td>22</td><td>8</td><td>2</td><td>3</td><td>9</td><td>23</td><td>43</td></tr> <tr><td>X</td><td>32</td><td>20</td><td>14</td><td>15</td><td>21</td><td>33</td><td>X</td></tr> <tr><td>X</td><td>X</td><td>36</td><td>28</td><td>29</td><td>37</td><td>X</td><td>X</td></tr> </table>	X	X	50	44	45	51	X	X	X	46	34	26	27	35	47	X	48	30	16	10	11	17	31	49	40	24	12	4	5	13	25	41	38	18	6	0	1	7	19	39	42	22	8	2	3	9	23	43	X	32	20	14	15	21	33	X	X	X	36	28	29	37	X	X
X	X	44	32	33	45	X	X																																																																																																																																																																																												
X	34	24	16	17	25	35	X																																																																																																																																																																																												
46	26	12	4	5	13	27	47																																																																																																																																																																																												
36	18	6	0	1	7	19	37																																																																																																																																																																																												
38	20	8	2	3	9	21	39																																																																																																																																																																																												
48	28	14	10	11	15	29	49																																																																																																																																																																																												
X	40	30	22	23	31	41	X																																																																																																																																																																																												
X	X	50	42	43	51	X	X																																																																																																																																																																																												
X	X	40	32	33	41	X	X																																																																																																																																																																																												
X	36	24	16	17	25	37	X																																																																																																																																																																																												
48	28	12	4	5	3	29	49																																																																																																																																																																																												
42	20	8	0	1	9	21	43																																																																																																																																																																																												
44	22	10	2	3	1	23	45																																																																																																																																																																																												
50	30	14	6	7	5	31	51																																																																																																																																																																																												
X	38	26	18	19	27	39	X																																																																																																																																																																																												
X	X	46	34	35	47	X	X																																																																																																																																																																																												
X	X	50	44	45	51	X	X																																																																																																																																																																																												
X	46	34	26	27	35	47	X																																																																																																																																																																																												
48	30	16	10	11	17	31	49																																																																																																																																																																																												
40	24	12	4	5	13	25	41																																																																																																																																																																																												
38	18	6	0	1	7	19	39																																																																																																																																																																																												
42	22	8	2	3	9	23	43																																																																																																																																																																																												
X	32	20	14	15	21	33	X																																																																																																																																																																																												
X	X	36	28	29	37	X	X																																																																																																																																																																																												
CONTROL POINTS																																																																																																																																																																																																			

FIG. 16B

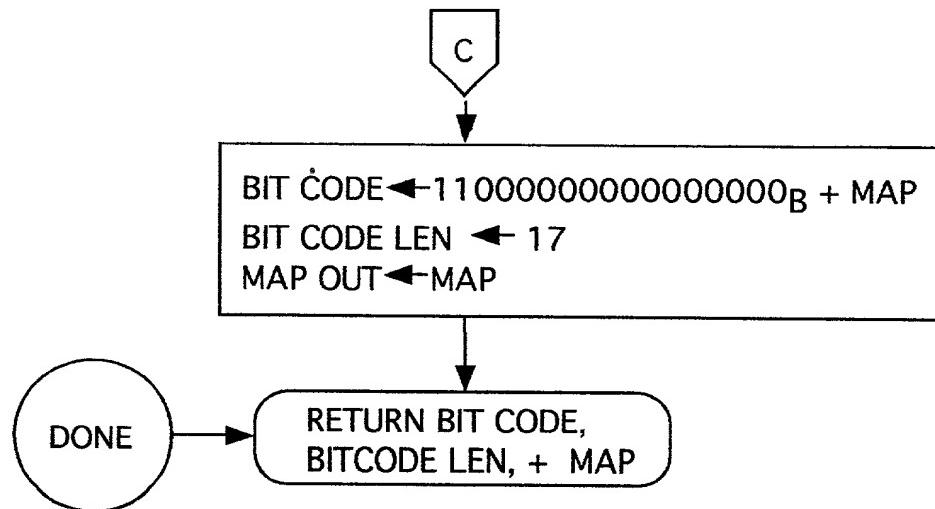


FIG. 15D

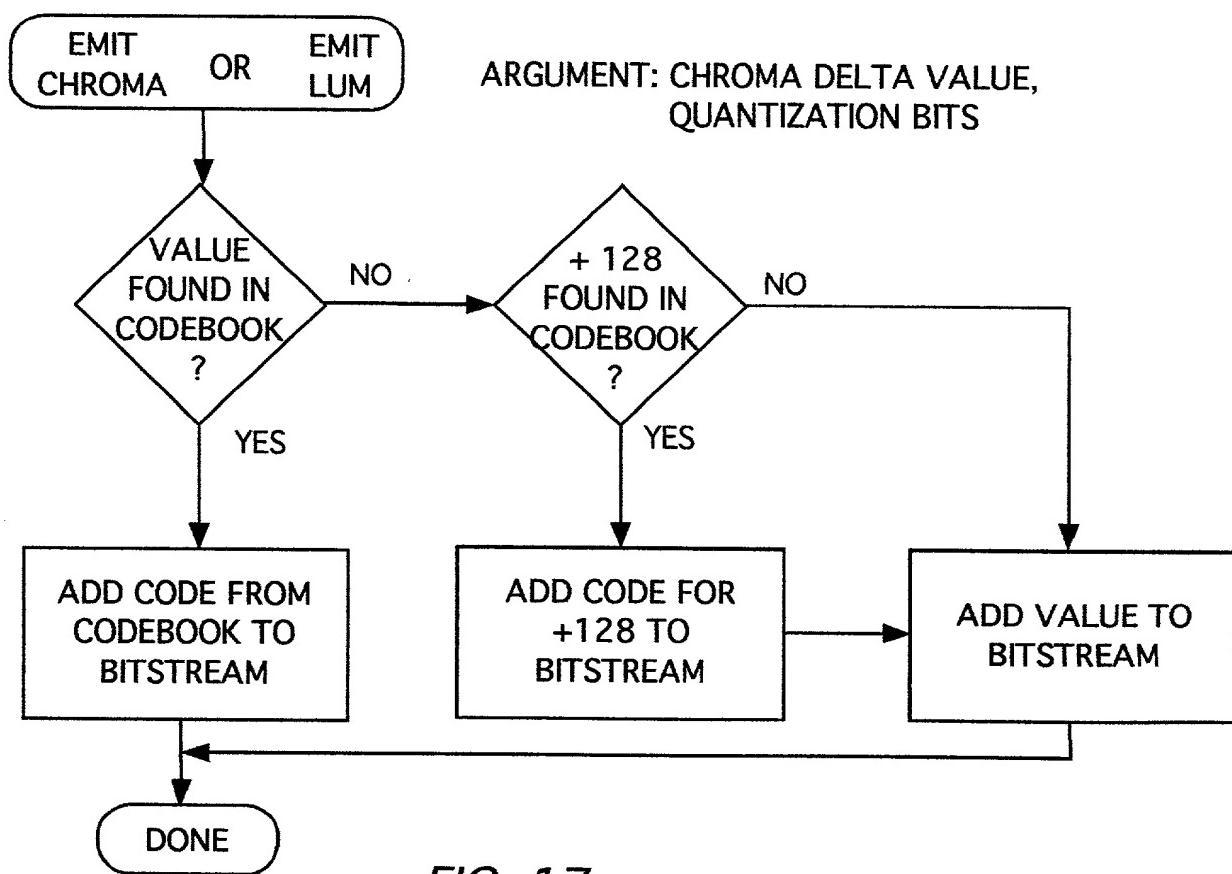


FIG. 17

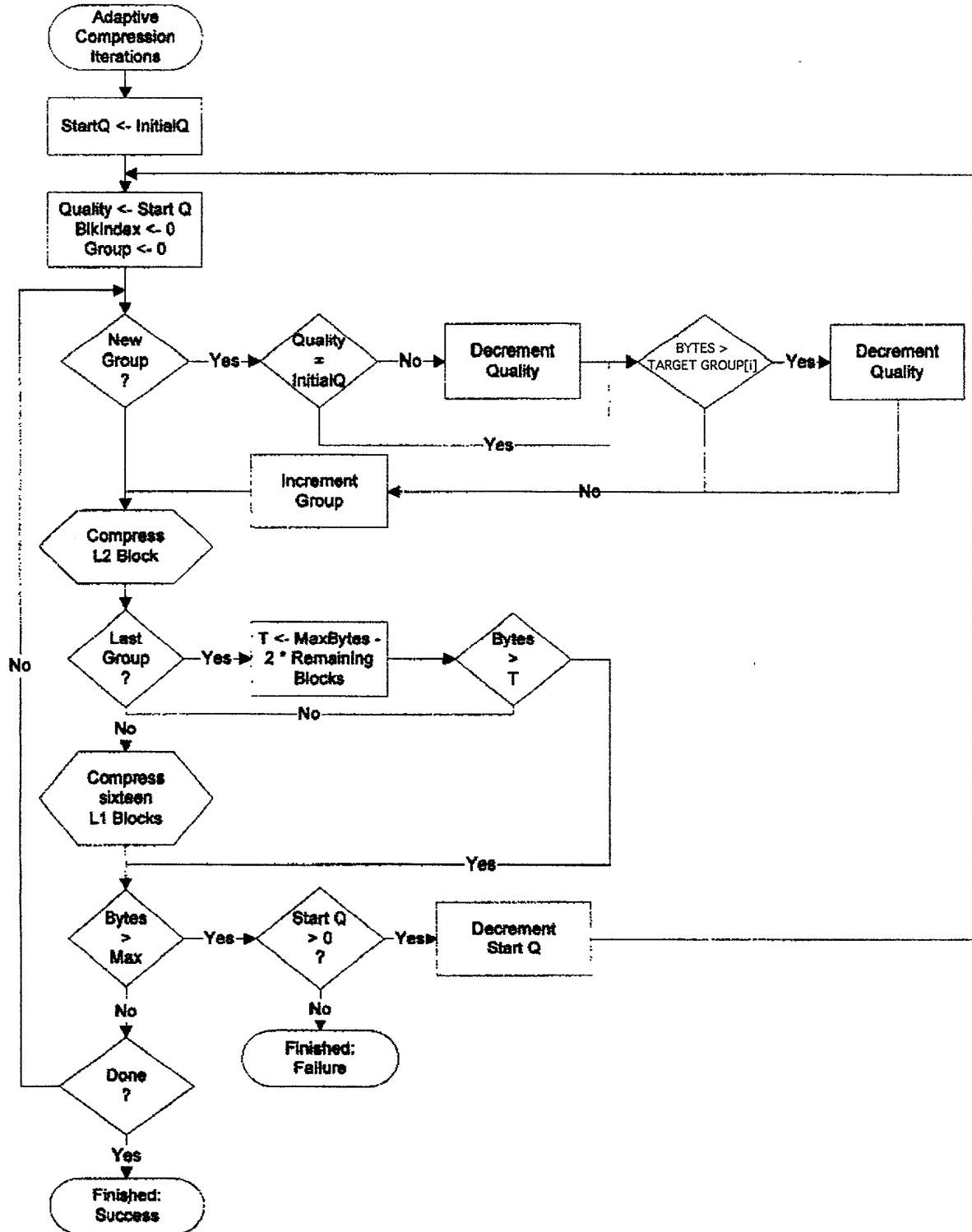


FIG. 18

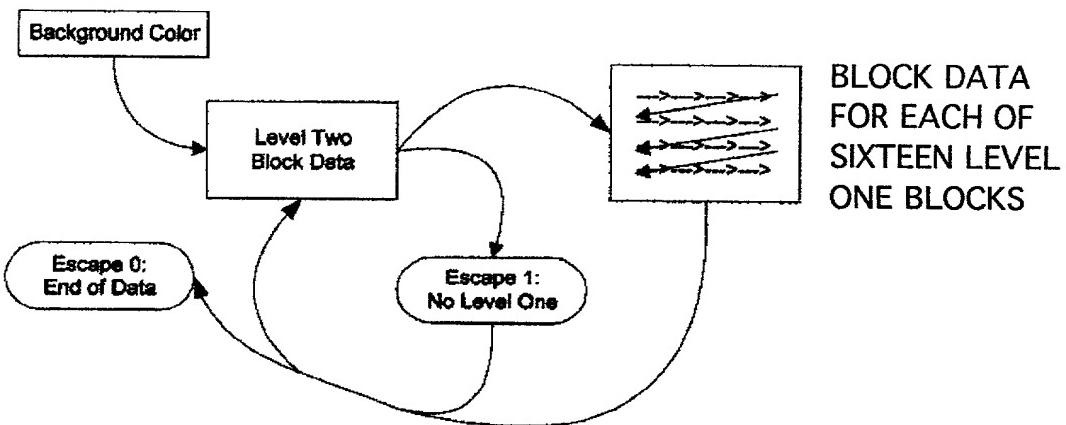


FIG. 19

Input				
A	B	C	D	E
F	G	H	I	J
K	L	M	N	O
P	Q	R	S	T
U	V	W	X	Y

FIG. 20A

Light Edge Filter				
A	B _{1/4} C _{1/4}	B _{1/4}	D	E
S _{1/4} K _{1/4}	9G/16 3H/16 3L/16 M/16	9H/16 3G/16 3M/16 L/16	3U/4 N/4	3J/4 O/4
S _{1/4} G _{1/4}	9L/16 3M/16 3G/16 H/16	9M/16 3L/16 3H/16 G/16	3N/4 I/4	3O/4 J/4
P	3Q/4 R/4	Q/4	S	T
U	3V/4 W/4	V/4	X	Y

FIG. 20B

Medium Edge Filter				
A	B _{2/3} C _{1/3}	B _{2/3}	D	E
2F/3 K/3	4G/9 2H/9 2L/9 M/9	4H/9 2G/9 2M/9 L/9	2I/3 N/3	2J/3 O/3
2K/3 F/3	4L/9 2M/9 2G/9 H/9	4M/9 2L/9 2H/9 G/9	2N/3 I/3	2O/3 J/3
P	2O/3 R/3	Q/3	S	T
U	2V/3 W/3	V/3	X	Y

FIG. 20C

Heavy Edge Filter				
A	B _{1/2} C _{1/2}	C _{1/2}	D	E
F/2 K/2	H/4 G/4	G/4 M/4	H/4 M/4	V/2 N/2 U/2
K/2 P/2	H/4 G/4	G/4 M/4	H/4 L/4	N/2 V/2 O/2
P	Q/2 R/2	R/2 Q/2	S	T
U	V/2 W/2	W/2 V/2	X	Y

FIG. 20D

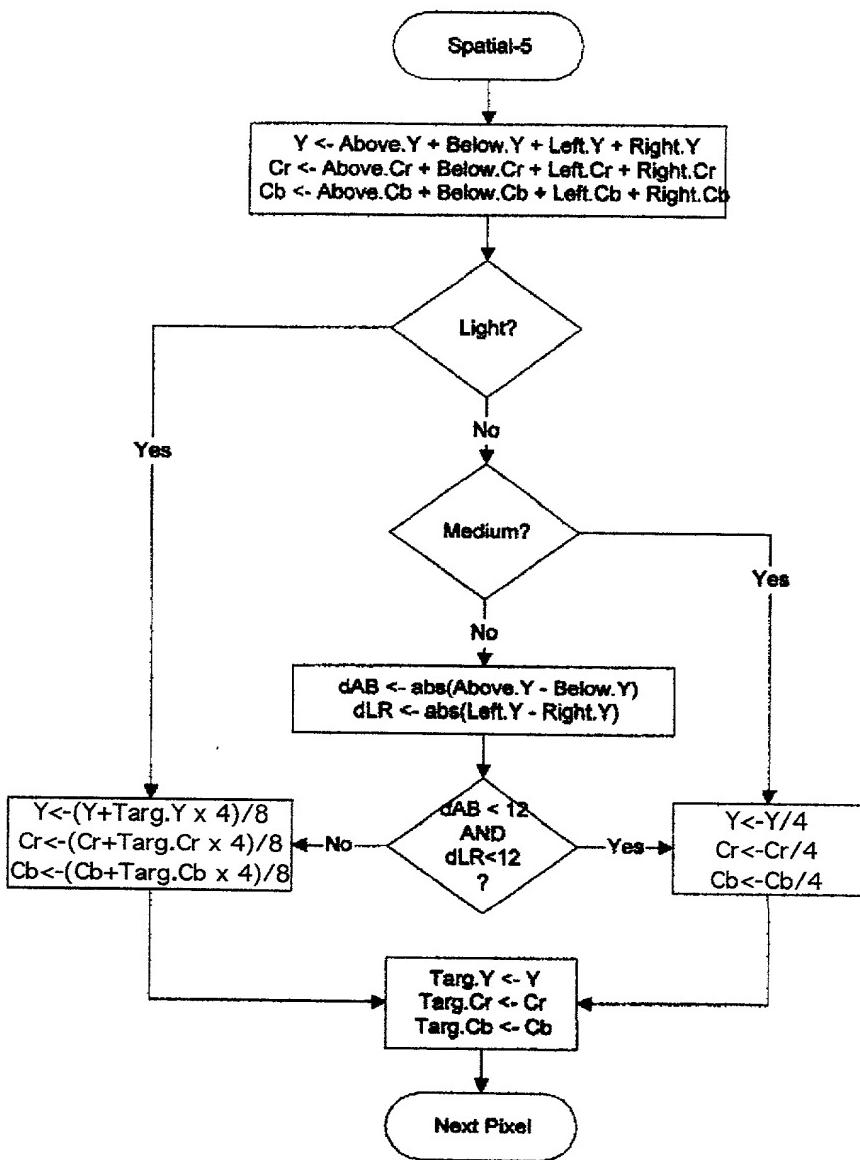


FIG. 21

RE35000000000000000000000000000000

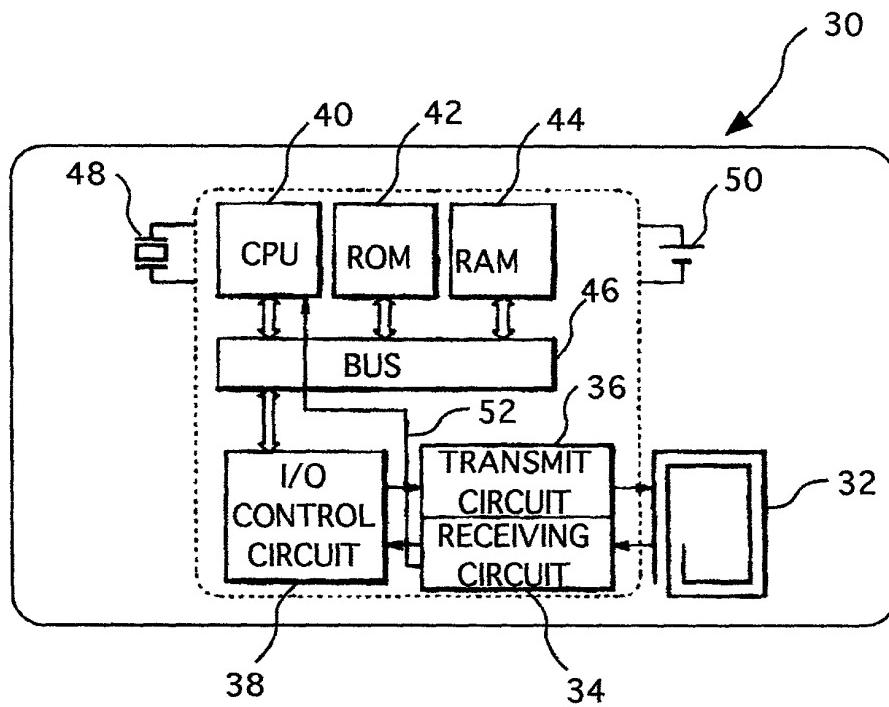


FIG. 22